

**CLAIMS**

1. Apparatus for the continuous tight heat-sealing of the longitudinal overlapping edges of tubular pieces of thermoplastic film, the thickness of which may be limited, produced by unwinding the film from a reel and advancing the said film longitudinally through a tubularizing mandrel (1), which apparatus is characterized in that it comprises means (31, 33) for guiding and for holding the said longitudinal edges of the tubularized film so that they overlap with an intimate and sufficiently distributed contact and in that it comprises in an opposing position, a short distance from these guide means, a sealing head (6) made in a material with good mechanical strength, with a low coefficient of friction in relation to the film to be sealed and with a high degree of thermal insulation, which directs onto the edges of the film to be sealed at least one continuous jet of air or other gas, heated to an appropriate temperature and at an appropriate pressure, which is connected by flexible or jointed means (38) to a fixed generator of hot compressed air (39) controlled by suitable supply and control means (40-44), and which is mounted on means of approach and withdrawal (45), such that, when the film advances, the said head is placed at the correct time a short distance from the said film and already fully operational, whereas when the film stops, at the correct time the head is withdrawn from the said film.

20

2. Apparatus according to Claim 1, in which the means for guiding the edges of the film to be sealed longitudinally comprise a flat fixed opposing block (31) of suitable thickness, over which the said edges of the film slide, this opposing block being appropriately rounded at its edges and being made in a suitable engineering polymer.

25

3. Apparatus according to Claim 2, in which immediately downstream of the opposing block (31) is a guide means (33) that acts on the opposite face of the overlapping edges of the film from that on which the opposing block acts, this in order to ensure constant contact between the film and the opposing block, the guide

30

means also being made preferably in a suitable engineering polymer.

4. Apparatus according to Claim 3, in which the said guide means (33) consists of a roller positioned with its axis (133) perpendicular to the direction of advance of the film.

5. Apparatus according to Claim 1, in which the sealing head (6) is made in a suitable engineering polymer.

6. Apparatus according to Claim 1, in which the sealing head (6), viewed end-on in the direction of advance of the film to be sealed, is of an essentially rectangular shape, with the upper long sides bevelled, and the upper face (34) of the head has a footprint essentially the same as or little different from the effective footprint of the said opposing block (31) over which the edges of the film to be sealed slide.

7. Apparatus according to Claim 6, in which there is open, on the upper face (34) of the sealing head (6), at least one rectangular slit (35) whose dimensions are correlated to the thickness and characteristics of the film to be sealed, the slit being oriented so that its greatest dimension is in the direction of advance of the film and communicating with a buffer chamber (36) of suitable volume formed inside the said head and connected by branched ducts (136) to the flexible and heat-resistant pipe (38) leading from the generator (39) supplying hot compressed air.

8. Apparatus according to Claim 7, in which there are open, on the upper face (34) of the sealing head (6), two rectangular slits (35) symmetrically arranged to produce on the overlapping edges of the film two continuous longitudinal seals to ensure tightness.

9. Apparatus according to Claim 7, characterized in that in order to seal barrier-effect stretch films with a thickness of about 40 microns, the said slits (35) in the

sealing head (6) have a width of about 0.3 mm.

10. Apparatus according to Claim 9, in which the slits (35) in the sealing head (6) are separated by a distance of about 6 mm.

5

11. Apparatus according to Claim 7, characterized in that in order to seal barrier-effect stretch films with a thickness of about 40 microns, jets of hot air pass out through the slits (35) in the sealing head at a temperature of between 160 and 180°C, for example about 170°C, and at a pressure of between 0.1 and 0.8 bar, for example about 0.2-0.4 bar.

10

12. Apparatus according to Claim 1, in which the generator (39) supplying the hot compressed air is connected by its air inlet (239) to a source supplying compressed air, through a pressure reducer (40), while its electrical terminal (339) connects the generator to an electrical supply interface (41) controlled by a processor (42) which, by means of heat sensors (43) and pressure sensors (143), senses the operating temperature and pressure, respectively, of the generator, which is connected to a programming and control unit (44) and which is equipped with an output terminal (142) which in the event of an anomaly tells the general computer (29) of the packaging machine that the sealing head (6) must be rested and the emergency measures activated.

15

20

13. Apparatus according to Claim 12, in which the heat sensor (43) and the pressure sensor (143) of the hot compressed air generator (39) are located at the discharge port (139) and at the inlet port (239), respectively, of the said generator.

25

14. Apparatus according to Claim 12, in which, in normal operating situations, the sealing head (6) works continuously at normal output and, when lowered to move it away from the film because the film is stationary, screening means are activated to deflect the flow of hot compressed air emerging from the head.

30

15. Apparatus according to Claim 14, in which the said screening means consist of a horizontal cold or room-temperature compressed-air knife (151) emitted by a short fixed bar (51), the said sealing head (6) moving to a lower level than this bar when in the low or rest position.

16. Apparatus according to Claim 15, in which the short fixed bar (51) that emits the air knife (151) to screen the air jets emitted by the sealing head (6) in the rest position is provided with a nozzle (251) that emits a jet of cooling air onto the continuous seals produced by the said head (6) in the active position.

17. Apparatus according to Claim 12, in which there may be located at the discharge port of the hot compressed air generator (39) a deflector device which in phase with the up or down movement of the sealing head (6) switches its state so as to supply the sealing fluid to the head or deflect it in other directions, optionally to a recovery or recirculating circuit, respectively, the whole being such that when the sealing head is raised, it is promptly fully operational.

18. Apparatus according to Claim 1, in which the sealing head (6) is attached to the moving part of a rectilinear actuator (45) mounted on a slide (46) that moves on guide means (47) parallel to the movement of the said actuator, the said slide being pushed in one direction by elastic means (48) and being movable in the opposite direction by means of an adjusting screw (49), all in such a way that it is possible to adjust the distance of the sealing head (6) from the film to be sealed when in the active sealing position.

19. Apparatus according to Claim 18, in which the actuator (45) is a double-acting fluid-pressure cylinder with a non-rotating rod.

20. Apparatus according to Claim 18, in which the rectilinear actuator (45) is of the

type controlled by a motor with electronic control of speed and phase, so that the sealing head (6) can be moved towards and away from the film with appropriate decelerations and accelerations correlated to the starting and stopping of the film.

- 5 21. Apparatus according to Claim 1, characterized in that in the application to a machine for packaging products in barrier-effect stretch film, of the type that comprises a horizontal film-tubularizing mandrel (1), with the longitudinal edges of the film overlapped underneath the mandrel and sealed tightly by special means (6), that comprises a fixed tubular guide (1') passing longitudinally through the said  
10 mandrel in order to insert the product to be packaged in the tubular packaging, that comprises, upstream of the mandrel, means (27, 127, 28) for the controlled supply of packaging film, and that comprises, downstream of the said mandrel, gripping pincers (7, 7') for double sealing and intermediate cutting, that alternate upstream and downstream of the tubular packaging with the product inside, to form the said  
15 packaging with a prior longitudinal stretching operating, characterized in that the opposing block (31) on which the longitudinal edges of the film to be sealed are pressed and guided is fixed to the outer face of the bottom wall of the said guide (1'), while the guide roller (33) is mounted by its spindle (133) to the lower flanges of the said mandrel (1), which has a large slot (32) through which the said opposing block  
20 passes and through which the overlapping edges of the film are visible and can be prepared by the sealing head (6), the lifting and lowering actuator (45) of which is controlled by the main computer (29) in such a way that the said head is up while the film is advancing is synchronized to be down when the said film is stopped, and is temporarily raised during the phase of longitudinal stretching of each packaging,  
25 before the back of the packaging is closed.